Laravel Models and Controllers

From Mockup Data to Real Database Operations

Recap: Routes and Controllers

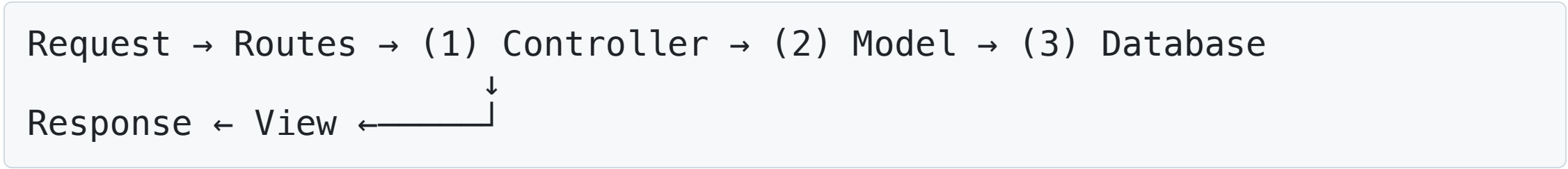
In the previous lesson, we learned about **Routes and Controllers** using **mockup data**:

```
    private function getStudent()
    {
        return [
            'id' => 1,
            'name' => 'John Doe',
            'major' => 'Computer Science'
        ];
    }
```

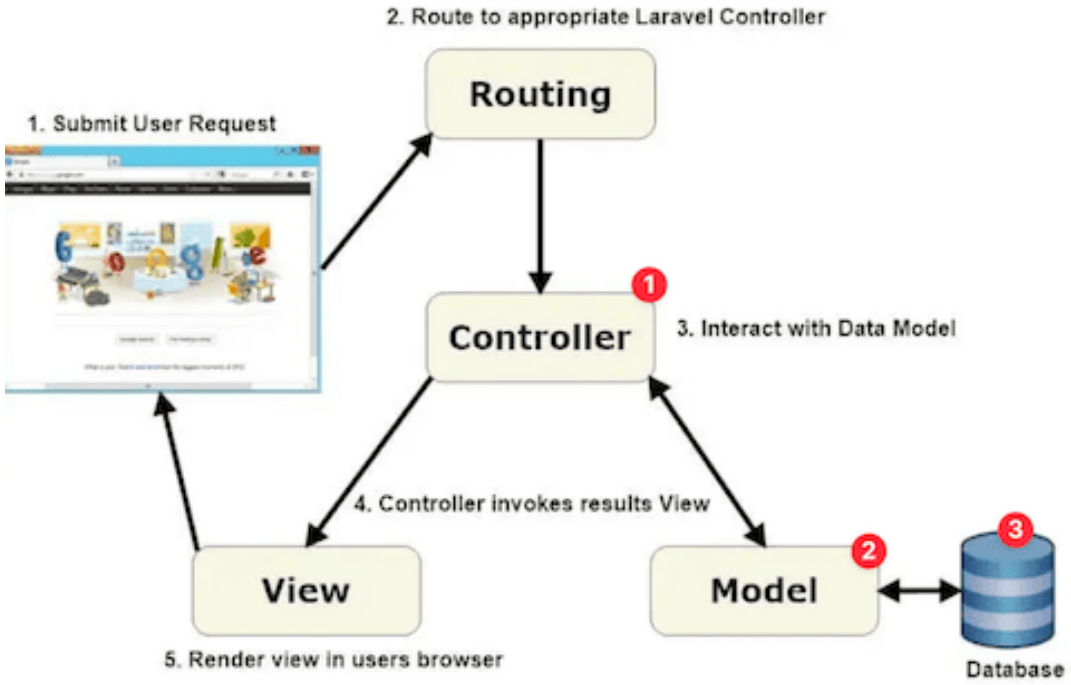
Today: Replace mockup data with **real database operations** using **Laravel Models**

The MVC Pattern in Laravel (Revisited)

Model-View-Controller (MVC)



- **Model**: Handles data and database operations
- **View**: Handles presentation (HTML/JSON responses)
- **Controller**: Handles business logic and coordinates Model + View


2. Route to appropriate Laravel Controller
Routing
1. Submit User Request
Controller
1
3. Interact with Data Model
4. Controller invokes results View
View
Model
2
3
5. Render view in users browser
Database

What is a Laravel Model?

Model = Database Table Representation

```
// Student Model represents 'students' table
class Student extends Model
{
    // Model automatically handles:
    // ✅ Database connections
    // ✅ CRUD operations (Create, Read, Update, Delete)
    // ✅ Data validation
    // ✅ Relationships with other models
    // ✅ Query building
}
```

One Model = One Database Table

Creating the Student Model

Generate Model with Migration:

```
php artisan make:model Student –m
```

This is a combination of two commands:

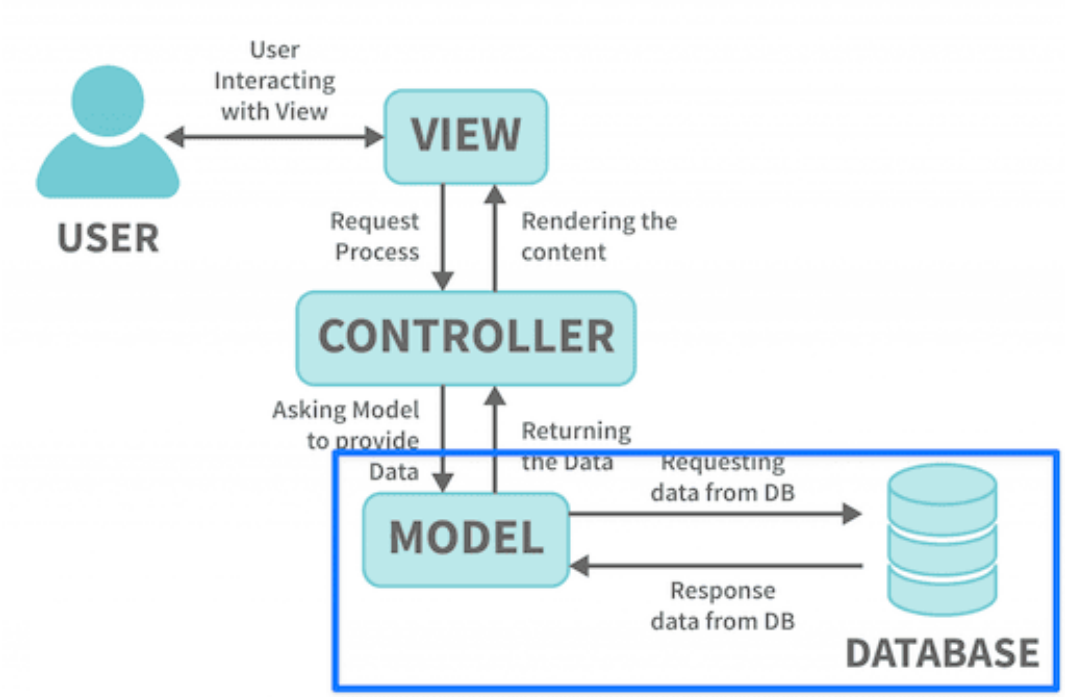
```
php artisan make:model Student
php artisan make:migration create_students_table
```

This Creates Two Files:

1. **`app/Models/Student.php`** - The model class
2. **`database/migrations/xxxx_create_students_table.php`** - Database structure

What this creates:

- **Model**: PHP class to interact with the database
- **Migration**: Blueprint to create a database table



Student Model Definition

Laravel creates the Model class that inherits from the Model class; we can use these methods freely.

Operation	Laravel Model
Get All	`return Student::all();`
Find by ID	`Student::find($id)`
Create	`Student::create($data)`
Update	`$student->update($data)`
Delete	`$student->delete()`
Validation	Built-in validation

`app/Models/Student.php`:

We need to specify the elements in the Model by adding code.

```php
<?php
namespace App\Models;
use Illuminate\Database\Eloquent\Model;

class Student extends Model
{
    /**
     * Fields that can be mass assigned
     */
    protected $fillable = [
        'name',
        'email',
        'major',
        'year'
    ];

    /**
     * Cast attributes to specific types
     */
    protected $casts = [
        'year' => 'integer',
    ];
```

Model Features Explained

$fillable - Mass Assignment Protection

We use the create static method to create a student model, but we can use only the fillable elements.

```
// ✅ Safe - only allowed fields can be set
$student = Student::create([
    'name' => 'John Doe',
    'email' => 'john@university.edu',
    'major' => 'Computer Science',
    'year' => 2
]);

// ❌ Dangerous without $fillable protection
$student = Student::create($request->all()); // Could set any field!
```

$fillable prevents malicious users from setting unexpected fields

Generated Migration

database/migrations/xxxx_create_students_table.php

File: `database/migrations/2024_xx_xx_create_students_table.php`

```php
<?php
use Illuminate\Database\Migrations\Migration;
use Illuminate\Database\Schema\Blueprint;
use Illuminate\Support\Facades\Schema;

// anonymous class (Laravel 8 and PHP 7+)
return new class extends Migration
{
    public function up() { ... }
    public function down() {...}
}
```

As the automatically generated class is empty, we need to make the schema for the class accordingly.

```
public function up()
{
    Schema::create('students', function (Blueprint $table) {
        $table->id();                       // Auto-increment primary key
        $table->string('name');             // VARCHAR(255)
        $table->string('email')->unique(); // UNIQUE VARCHAR(255)
        $table->string('major');            // VARCHAR(255)
        $table->integer('year');            // INT
        $table->timestamps();               // created_at, updated_at
    });
}
```

This allows the migration to be rolled back safely.

```
public function down()
{
    Schema::dropIfExists('students');
}
```

Run Migration to Create Table

```
# Create the database table
php artisan migrate

# Output:
# Migrating: 2024_01_01_000000_create_students_table
# Migrated:  2024_01_01_000000_create_students_table (0.02 seconds)
```

This creates the `students` DB table:

Field	Type	Extra
id	BIGINT UNSIGNED	PRIMARY KEY, AUTO_INCREMENT
name	VARCHAR(255)	
email	VARCHAR(255)	UNIQUE
major	VARCHAR(255)	
year	INT	
created_at	TIMESTAMP	
updated_at	TIMESTAMP	

Summary

1. `php artisan make:model Student -m` to create a model and migration.
2. Manually add the Student model and schema up() method.
3. `php artisan migrate` to create a DB table.

Updating Controllers to Use Models

Before: Web Controller with Mockup Data

```
    public function index()
    {
        // Mockup data
        $student = $this->getStudent();

        return '<h1>Student Information</h1>
                <p>ID: ' . $student['id'] . '</p>
                <p>Name: ' . $student['name'] . '</p>
                <p>Major: ' . $student['major'] . '</p>
                <a href="/student/create">Add New Student</a>';
    }
```

After: Web Controller with Model

```php
<?php
namespace App\Http\Controllers;
use App\Models\Student;
use Illuminate\Http\Request;

class StudentController extends Controller
{
    public function index()
    {
        // New way: Database query through Model
        $students = Student::all();
        return ...
    }

    public function show(Student $student)
    {
        // New way: Route Model Binding (automatic!)
        // Laravel automatically finds the student or returns 404
        return view('students.show', compact('student'));
    }
}
```

Route Updates for Models

Route Naming (->Name())

```
Route::get('/students', [StudentController::class, 'index'])
    ->name('students.index');
Route::get('/students/{student}', [StudentController::class, 'show'])
    ->name('students.show');
```

The ->name() is like giving a nickname to your route; you don't have to use hardcoding URLs.

```
// Instead of hardcoding URLs (bad practice):
return redirect('/students');
return redirect("/students/{$student->id}");

// In your controllers
return redirect()->route('students.index');
return redirect()->route('students.show', $student);
```

Model Binding

Model binding works when you have a parameter in your route:

```
Route::get('/students/{student}', [StudentController::class, 'show'])
    ->name('students.show');
```

Without and with Model Binding:

```
// Instead of writing this in your controller:
public function show($id) {
    // You have to do the database lookup
    $student = Student::findOrFail($id);
    return ...
}

// You can write this (much cleaner!):
public function show(Student $student) {
    return ...
}
```

In this example, when `/students/90` is given, the Laravel automatically does this behind the scenes:

```php
// 1. Laravel extracts "90" from the URL parameter {student}
$id = 90;

// 2. Laravel automatically runs this query for you:
$student = Student::findOrFail(90);

// 3. Laravel passes the found Student object to your method:
public function show(Student $student) {...}
```

The `resource` method for automatic Model Binding

When we need to make these

```
// routes/web.php
Route::get('/students', ...
Route::get('/students/create', ...
Route::post('/students', ...
Route::get('/students/{student}', ...
Route::get('/students/{student}/edit', ...
Route::put('/students/{student}', ...
Route::delete('/students/{student}', ...
```

We can use the `resource` method:

```
Route::resource('students', StudentController::class);
```

Updated API Routes

For API, we can use apiResource (backslashes (\) are used for namespaces):

```
// routes/api.php
Route::apiResource('students', Api\StudentController::class);
```

run1-5.sh

⚠️ WSL2 Warning: Run `dos2unix` command before running the script.

Copy the corresponding files and script from the corresponding directory.

```
# in the temp/ase230 directory (for example)
bash run1-4.sh # run script
cd student-api
php artisan serve
# WSL2
php artisan serve --host=0.0.0.0
# Access <http://localhost:8080>
```

Testing Your Models

Browser Testing (Web Routes)

- Visit: `http://localhost:8000/students`
- Create, edit, and delete students through forms
- Data persists in the database

API Testing (Postman/curl)

```
# Get all students
curl http://localhost:8000/api/students

# Create student
curl -X POST http://yourapp.com/api/students \
  -H "Content-Type: application/json" \
  -d '{"name":"Test Student","email":"test@uni.edu","major":"Engineering","year":1}'
```

Data now persists between requests!